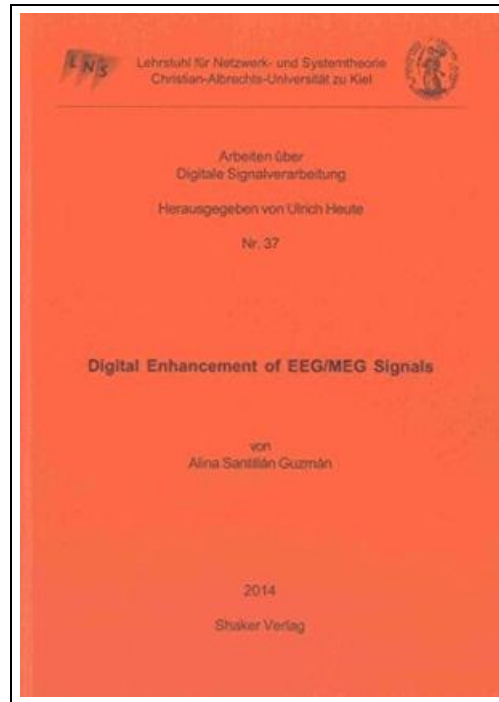


## Digital Enhancement of EEG/MEG Signals



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Shaker Verlag Mrz 2014, 2014. Buch. Condition: Neu. Neuware - Electroencephalography (EEG) and Magnetoencephalography (MEG) recordings are commonly used for analyzing the brain. However, in most cases, the recordings not only contain brain waves, but also artifacts of physiological (ocular, muscle, ECG artifacts) or technical (electrode popping, power-line) origins, and noise from different sources. The main aim of the work described in this thesis is the noise reduction and artifact suppression from EEG and MEG signals. Different techniques for artifact suppression have been used: A Low-Pass Filter (LPF), an instantaneous Independent Component Analysis (ICA) algorithm, a combination of ICA and LPF, a combination of ICA and State-Space Modeling (SSM), a combination of ICA and Wiener filters, and a hybrid filter (i.e., a filter that works in the time- and frequency-domains). These techniques have been tested only offline in the present work. Additionally, two artifact suppression methods that could work either offline or in real-time have been tested in real-time. The first one is a recent approach used for signal enhancement, called Empirical Mode Decomposition (EMD). This method is employed in this work for denoising, for detrending, and for suppressing the muscle artifacts from EEG signals. The second method is an algorithm here called Classification-based Signal Enhancement (CBSE). It was also used to suppress muscle artifacts in EEG signals, in real-time, using Wiener filters for signal enhancement. In order to use any artifact suppression technique, the artifacts to be removed have to be previously identified. If the artifact suppression is done offline, the detection can be carried out by visual inspection of the data by an expert, or in an automatic way. On the other hand, if the suppression of artifacts has to be done in real-time, the artifacts have to be detected automatically. A detection technique is proposed in the...

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